

# NOAASERVER: UNIFIED ACCESS TO DISTRIBUTED NOAA ENVIRONMENTAL DATA

Nancy Soreide<sup>1</sup> and Ernest Daddio<sup>2</sup>

<sup>1</sup>NOAA/Pacific Marine Environmental Laboratory, Seattle, Washington

<sup>2</sup>NOAA/Environmental Services Data and Information Management Office

## I. Overview

The NOAAServer Project [1, 2] was initiated out of NOAA's Environmental Services Data and Information Management (ESDIM) office in 1995 to address broad agency needs to integrate on-line environmental information services. It now provides integrated access to 14 Web servers and includes capabilities to read documentation of datasets, generate graphical browser products, download data via FTP, and order off-line data products. More than 15,000 records of data descriptions are accessible, providing documentation of NOAA's vast store of environmental information. This information includes satellite imagery, weather observations, technical documents, observations of global winds, climate analyses, ocean bathymetry, and ocean temperature and salinity fields.

## II. Background and Objectives

Historically, a user had to know specifically where in NOAA to direct inquiries for environmental information. With the advent of Web services, organizations in NOAA quickly incorporated Web information services into routine operations. Since NOAA's environmental observations and derived information products have been made and recorded in response to specific mission objectives of its individual operating units, information management systems have developed over time independently of one another. For the most part, these information systems utilize a broad range of data formats, data media, and overall different approaches to managing and preserving the national and global environmental record.

The NOAAServer project was initiated in response to mandates for NOAA to provide higher levels of integration among these systems and to provide users with one-stop shopping for NOAA environmental data and information. Additional goals include providing the user with a more uniform and better integrated methodology for obtaining NOAA environmental data, information, and graphics.

## III. Description of the Operational NOAAServer

The purpose of the NOAAServer System development effort is to provide unified access to distributed NOAA environmental data and information on the World Wide Web (WWW). Participants include all of the NOAA line offices (the National Environmental Satellite, Data, and Information Service, the National Marine Fisheries Service, the National Ocean Service, the National Weather Service, and Oceanic and Atmospheric Research). A growing portion of NOAA's data and information, over 15,000 data sets or data collections, is presently available through this system.

To accomplish its purpose, the NOAAServer Project is utilizing World Wide Web (WWW) technologies, by which NOAA's nationally distributed environmental information systems may be presented to the user as a unified view of NOAA's environmental information databases (Fig. 1, [1, 2]). In addition to providing an intuitive and unified agency environmental data and information server, this effort

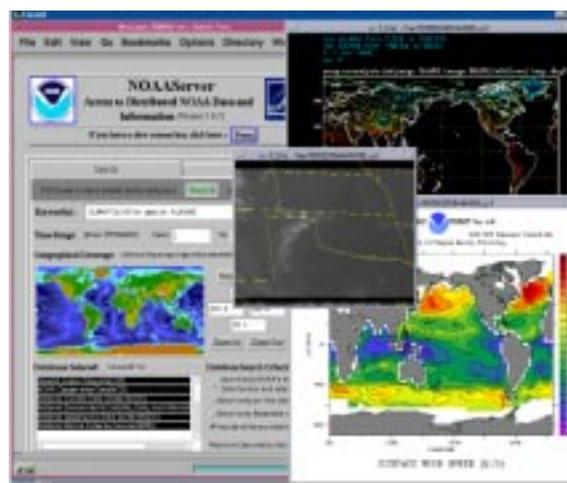


Fig. 1. Operational NOAAServer search screen and example data graphics.

has begun to address the need for a data model and a methodology for developing electronic inventories and catalog services.

To locate data with the NOAA Server System, a user enters search criteria, such as latitude, longitude, date, and keyword, using an interactive Java interface. The NOAA Server software searches distributed data holdings, and returns to the user a list of data collections meeting the search criteria. The user can view a description of the data collection (metadata), which includes contact and order information. If the data is on line, the user can interact, via the Web, with software at the data provider's site to further subset the data and obtain a dynamically generated plot or listing of the data. If the selected data set is sufficiently small, the data can be downloaded to the user's local disk.

Representative data sets include satellite raster images, time series of meteorological station measurements, two-dimensional oceanic parameter plots, text documents, and vertical profiles of measurements through the atmosphere and the ocean.

The underlying technology for the current operational NOAA Server [1, 2] includes 1) a Web browser at the user's desktop, 2) distributed data provider systems running an HTTP server; and 3) four mirrored servers containing search agent software and fundamental metadata databases identifying datasets and providing the URL links to the distributed data providers' computer systems. The user interface on the Web uses Java to create a convenient and interactive user environment.

#### IV. Description of the Next-Generation NOAA Server

Current NOAA Server capabilities are being expanded to utilize newer, state-of-the-art technologies for linking distributed sites using the industry-standard Common Object Request Broker Architecture (CORBA) and Java [2, 3, 4]. These technologies are currently being used by Fortune 500 companies for similar distributed systems. By utilizing these technologies, next-generation NOAA Server software can access existing legacy data access software via distributed CORBA servers, and the NOAA Server user will use a single common methodology to select and subset data from these distributed servers and co-plot the data on his desktop, using an interactive, Java graphics tool.

The new, next-generation NOAA Server software has been tested in prototypes, and co-plotting of data from distributed sources has been successfully demonstrated. In these demonstrations, four distributed CORBA servers containing meteorological upper air

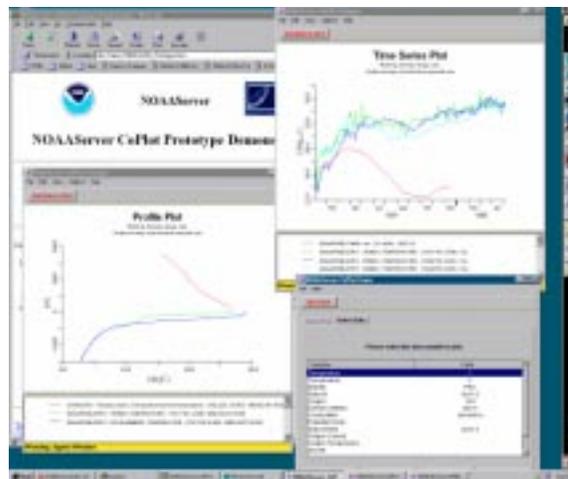


Fig. 2. Next-generation NOAA Server prototype demonstration links nine distributed CORBA data servers. Shown here is Java graphics of TAO El Niño buoy data, COADS climatology data and atmospheric and oceanic profile data. For more examples, please see:

- <http://www.pmel.noaa.gov/~nns/noaaserver/nodc-coads-tao.html>
- <http://www.pmel.noaa.gov/~nns/noaaserver/coads-cao-raster.html>
- <http://www.pmel.noaa.gov/~nns/noaaserver/ts-ctd-buoy-met.html>

sounding profiles, ocean profiles, ocean time series, ocean acoustic doppler current profiles, and global gridded oceanographic and meteorological datasets are linked together with next-generation NOAA Server software. Interactive, all-Java graphics routines [4] allow users to plot or overplot data from any of the distributed CORBA data servers (Fig. 2).

The prototype demonstrations have provided the required proof of concept for the next-generation NOAA Server. Operational servers are now under development for several distributed data sites and different types of oceanographic data. This effort is the subject of another presentation at this conference [3].

#### V. Conclusion

For the near-term, a hybrid communications architecture will be implemented within the NOAA Server system. The first will support conventional Web access to data and deliver to the user the usual JPEG and GIF files and server-specific graphical interface, and the second will support highly interactive and uniform graphical displays via CORBA services and downloadable Java client software. Such an implementation strategy supports two important

project goals: (1) making the cost of participation relatively easy and painless, and (2) providing a migration path via CORBA/Java to full-featured functionality including graphical integration of multiple parameters extracted from multiple databases.

The NOAAServer System can be accessed at <http://www.esdim.noaa.gov/NOAAServer>.

## VI. References

- [1] Daddio, E., and W. Brazille, 1996: NOAAServer: WWW Framework for a National Environmental Virtual Data System. Lake Buena Vista, FL, 4-7 November 1996, 377-382.
- [2] Daddio, E., and W. Brazille, 1998: NOAAServer Project: Integrating NOAA data and information services on the Web. In *14th International Conference on Interactive Information and Processing Systems (IIPS) for Meteorology, Oceanography, and Hydrology*, Phoenix, Arizona, 11-16 January, 1998, American Meteorological Society, 186-189.
- [3] Denbo, D.W., S. Hankin, J. Sirott, and W.H. Zhu, A unified browse environment for NOAA's data using distributed objects. In *Marine Technology Society/Ocean Community Conference '98*, Baltimore, Maryland, 16-19 November 1998 (in press).
- [4] Denbo, D.W. Using Java graphics to display Ocean observations in NOAAServer. In *15th International Conference on Interactive Information and Processing Systems (IIPS) for Meteorology, Oceanography, and Hydrology*, Dallas, Texas, 10-15 January 1999, American Meteorological Society (submitted).